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(54) **UPDATING DYNAMIC DATA USAGE PLANS AND STATISTICS**

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(57) **ABSTRACT**

Embodiments enable data usage plans and data usage statistics to be shared among user computing devices. In some embodiments, a web service receives a schema populated with data describing the data usage plan from a mobile operator. The web service distributes the populated schema to the user computing devices, and subsequently distributes updated portions of the schema as the data usage plan is updated by the mobile operator. The web service may also collect the data usage statistics from the user computing devices and the mobile operator, reconcile any differences, and send synchronization notifications to the user computing devices based on the reconciliation. In some embodiments, users are able to view bandwidth consumption by a plurality of user computing devices sharing the same data usage plan.

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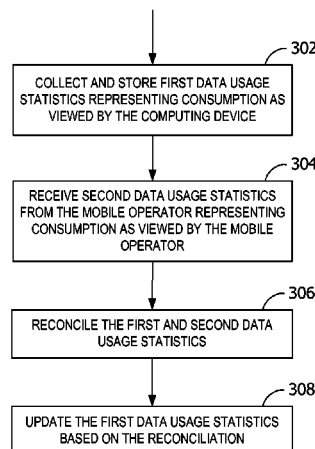
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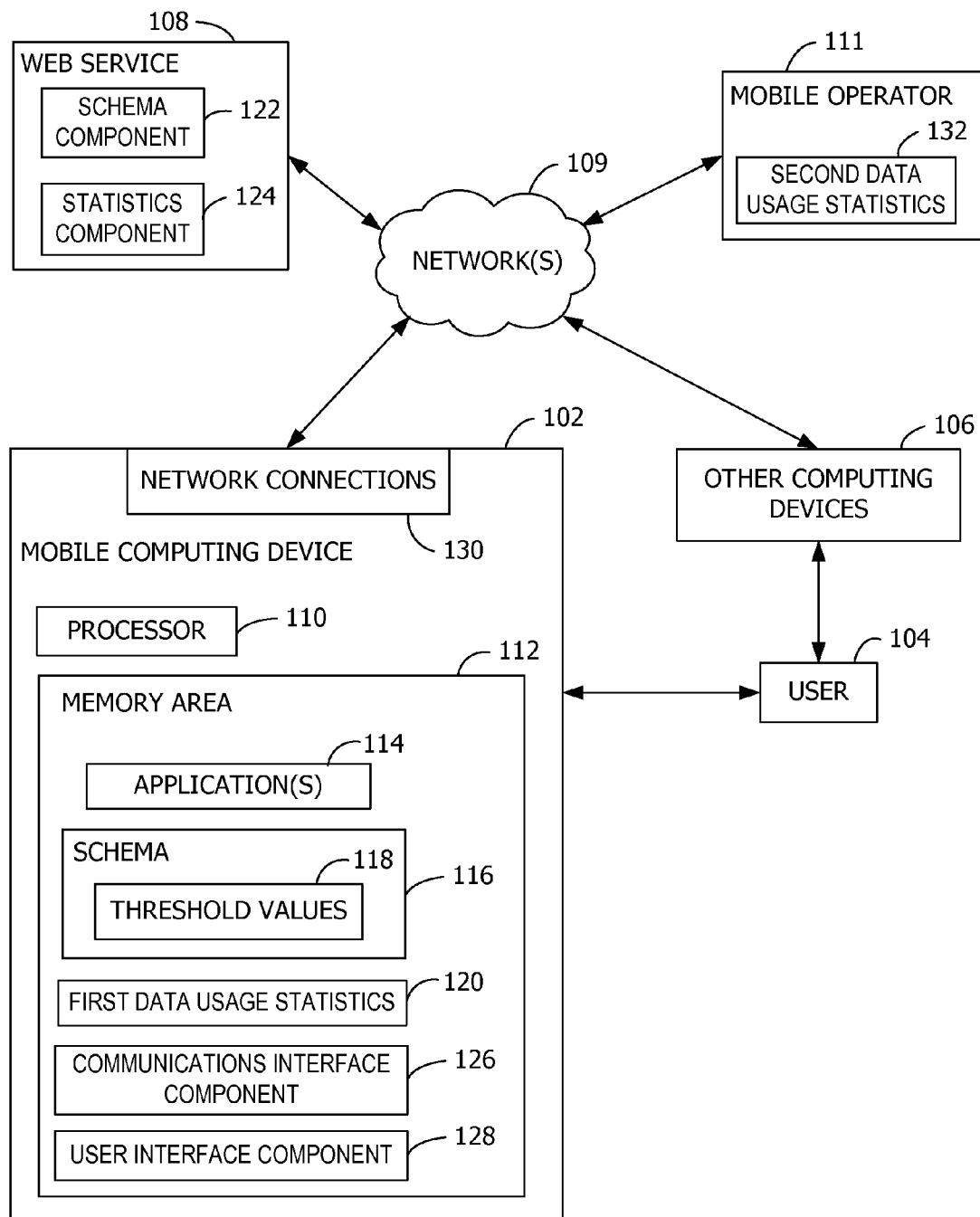"Office Action Issued in European Patent Application No. 13741434. 8", Mailed Date: Nov. 27, 2014, 6 Pages.

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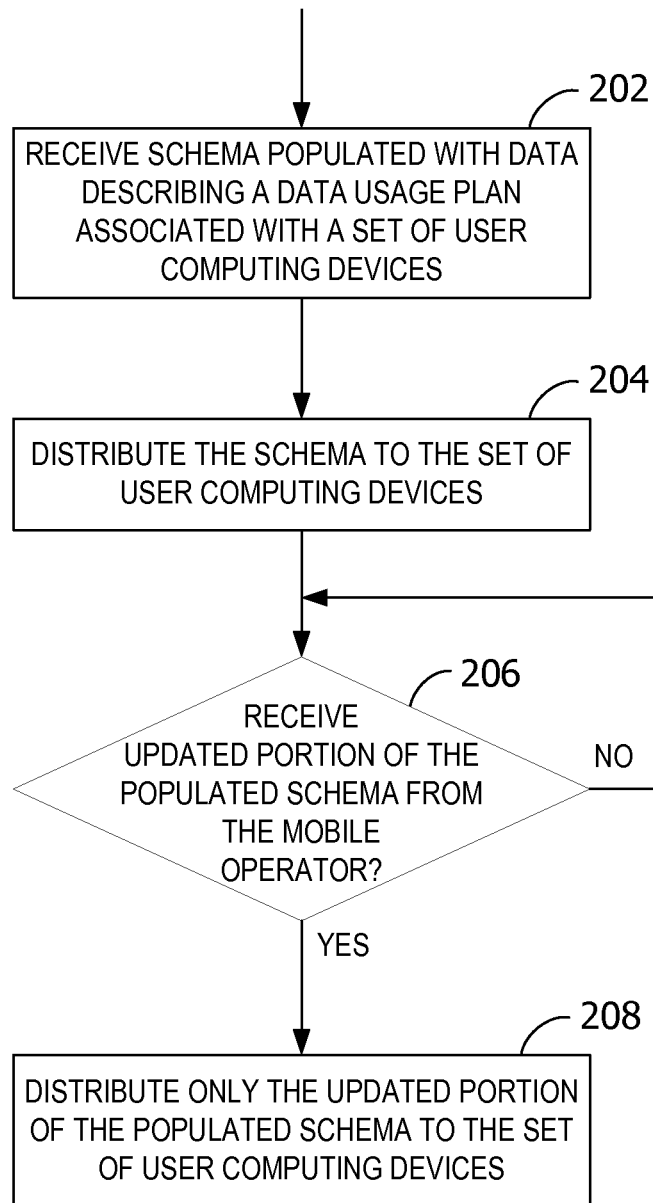
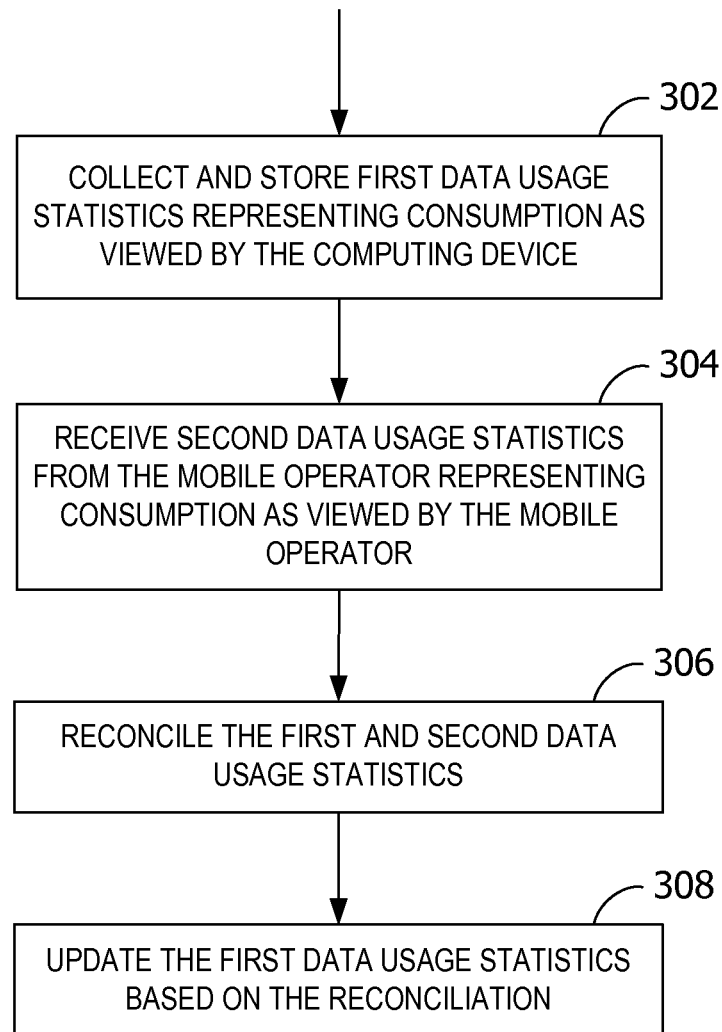"Office Action Issued in European Patent Application No. 13741633. 5", Mailed Date: Nov. 27, 2014, 7 Pages.

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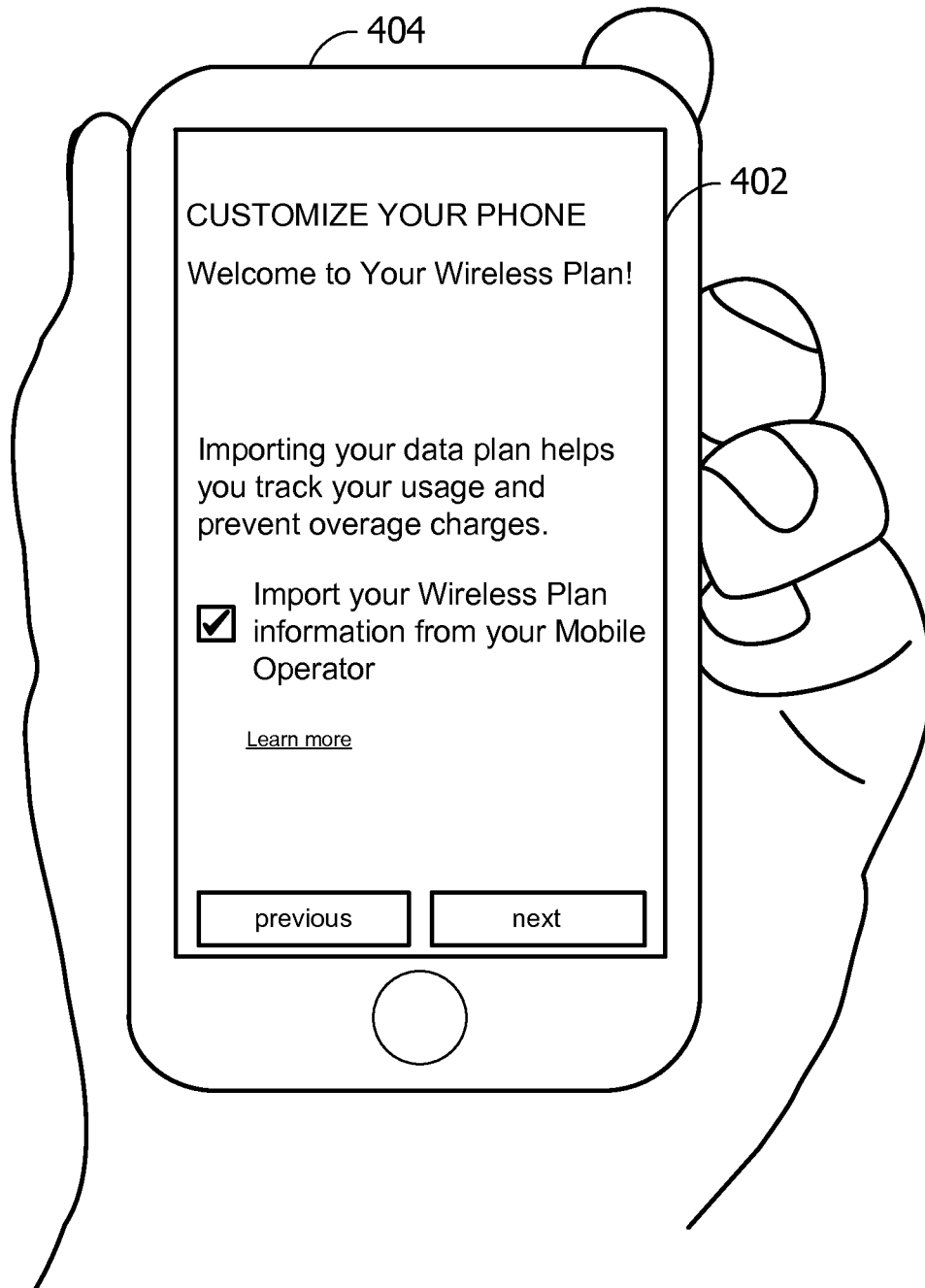
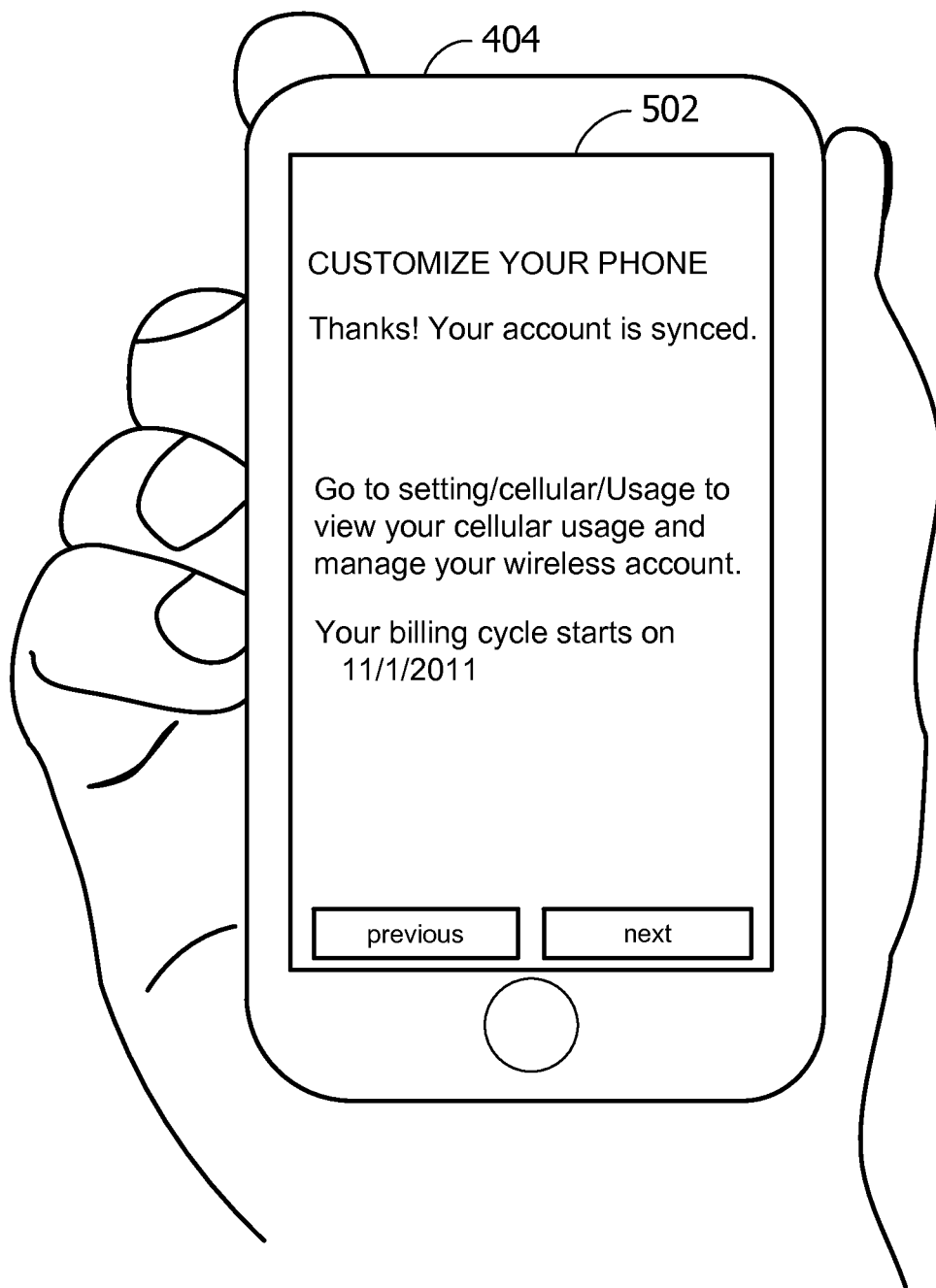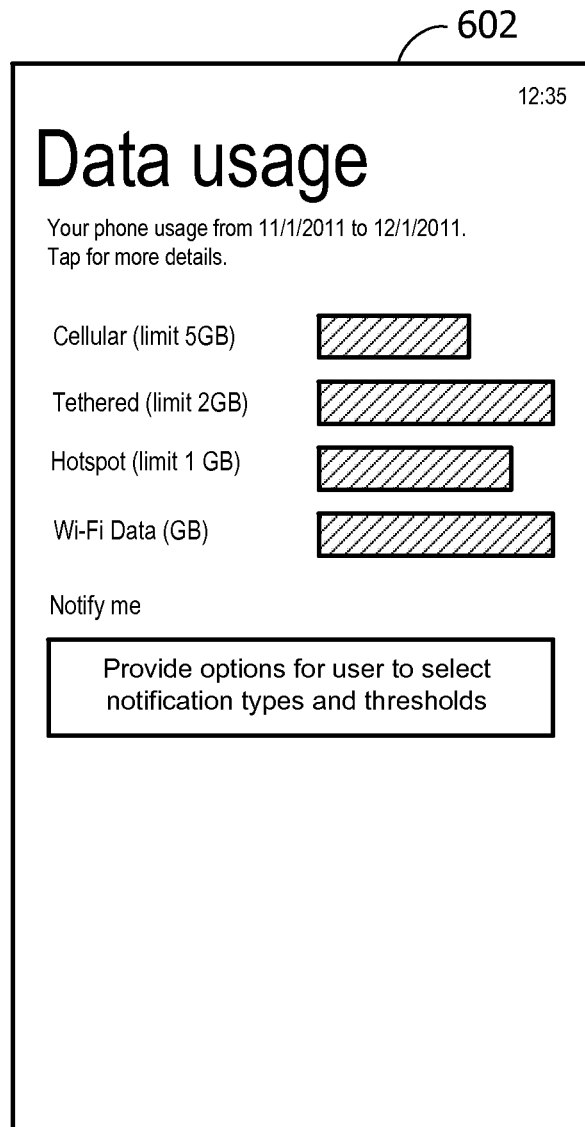Rhee, Ed, "How to Track Data Usage on your Android Phone", Published on: Jul. 8, 2011, Available at: http://www.cnet.com/how-to/how-to-track-data-usage-on-your-android-phone/, 4 pages.

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108 —

WEB SERVICE

SCHEMA COMPONENT — 122

STATISTICS COMPONENT — 124

— 111

MOBILE OPERATOR

SECOND DATA USAGE STATISTICS — 132

— 109

NETWORK(S)

— 102

NETWORK CONNECTIONS

MOBILE COMPUTING DEVICE   — 130

PROCESSOR — 110

— 112

MEMORY AREA

APPLICATION(S) — 114

SCHEMA — 116

THRESHOLD VALUES — 118

FIRST DATA USAGE STATISTICS — 120

COMMUNICATIONS INTERFACE COMPONENT — 126

USER INTERFACE COMPONENT — 128

— 106

OTHER COMPUTING DEVICES

— 104

USER

FIG. 1

202

RECEIVE SCHEMA POPULATED WITH DATA
DESCRIBING A DATA USAGE PLAN
ASSOCIATED WITH A SET OF USER
COMPUTING DEVICES

204

DISTRIBUTE THE SCHEMA TO THE SET OF
USER COMPUTING DEVICES

206

RECEIVE
UPDATED PORTION OF THE
POPULATED SCHEMA FROM
THE MOBILE
OPERATOR?

NO

YES

208

DISTRIBUTE ONLY THE UPDATED PORTION
OF THE POPULATED SCHEMA TO THE SET
OF USER COMPUTING DEVICES

FIG. 2

302

COLLECT AND STORE FIRST DATA USAGE
STATISTICS REPRESENTING CONSUMPTION AS
VIEWED BY THE COMPUTING DEVICE

304

RECEIVE SECOND DATA USAGE STATISTICS
FROM THE MOBILE OPERATOR REPRESENTING
CONSUMPTION AS VIEWED BY THE MOBILE
OPERATOR

306

RECONCILE THE FIRST AND SECOND DATA
USAGE STATISTICS

308

UPDATE THE FIRST DATA USAGE STATISTICS
BASED ON THE RECONCILIATION

FIG. 3

404

402

CUSTOMIZE YOUR PHONE

Welcome to Your Wireless Plan!

Importing your data plan helps
you track your usage and
prevent overage charges.

☑   Import your Wireless Plan
        information from your Mobile
        Operator

Learn more

| previous | next |

FIG. 4

FIG. 5

602

12:35

Data usage

Your phone usage from 11/1/2011 to 12/1/2011.
Tap for more details.

Cellular (limit 5GB)

Tethered (limit 2GB)

Hotspot (limit 1 GB)

Wi-Fi Data (GB)

Notify me

Provide options for user to select
notification types and thresholds

FIG. 6

Monthly Limit   702

DATASMART
overview by app
October 21, 2011 - now

DATA AVAILABLE*   136 of 200 MB

DAYS AVAILABLE   13 of 30 days

CELLULAR VS. WIFI
21% on cellular*
     136 MB
79% on wifi
     514 MB

FIG. 7A

Pay-as-you-go   704

DATASMART
overview by app

DATA AVAILABLE*   136 MB

Expires in 16 days

CELLULAR VS. WIFI   Last 30 days
21% on cellular*
     136 MB
79% on wifi
     514 MB

FIG. 7B

Unlimited/None   706

DATASMART
overview by app

CELLULAR VS. WIFI   Last 30 days

21% on cellular*
     136 MB
79% on wifi
     514 MB

TOTAL USAGE
640 MB

FIG. 7C

404

WEATHER | MAPS

MUSIC | MARKET PLACE

VIDEOS | 78% [ ]
TEXT MSGS
55% [ ]
DATA USE

FIG. 8

UPDATING DYNAMIC DATA USAGE PLANS AND STATISTICS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 61/696,472, filed Sep. 4, 2012, U.S. Provisional Application No. 61/591,503, filed Jan. 27, 2012, and U.S. Provisional Application No. 61/591,509, filed Jan. 27, 2012. The entirety of these provisional applications is hereby incorporated by reference herein.

This application is related to the following applications: U.S. Pat. No. 8,977,231 entitled "Tracking Data Usage Under a Schematized Data Usage Plan," U.S. patent application Ser. No. 13/721,066 filed Dec. 20, 2012 entitled "Managing Data Transfers Over Network Connections Based on Priority and a Data Usage Plan," U.S. patent application Ser. No. 13/721,083 filed Dec. 20, 2012 entitled "On-Device Attribution of Network Data Usage," U.S. patent application Ser. No. 13/721,041 filed Dec. 20, 2012 entitled "Predicting Network Data Consumption Relative to Data Usage Patterns," U.S. patent application Ser. No. 13/721,029 filed Dec. 20, 2012 entitled "Data Usage Profiles for Users and Applications," U.S. patent application Ser. No. 13/721,023 filed Dec. 20, 2012 entitled "Recommendations for Reducing Data Consumption Based on Data Usage Profiles," U.S. Pat. No. 9,049,589 entitled "Dynamically Adjusting a Data Usage Plan Based on Data Usage Statistics," and U.S. patent application Ser. No. 13/721,058 filed Dec. 20, 2012 entitled "Managing Network Data Transfers in View of Multiple Data Usage Plans." All of these applications are incorporated by reference herein in their entirety.

BACKGROUND

With the increased popularity of smart telephones, tablets, and other mobile devices, there has been a similar increase in the amount of data handled by the networks of mobile operators. To reduce the strain on network infrastructure and to reduce network transfer costs, mobile operators are shifting from offering simple unlimited mobile data plans to offering capped and metered plans. Some of these capped and metered plans are complex, with allotted data caps varying based on network type, time of day, etc. Further, the fees for exceeding the allotted data caps may be significant and may also vary based on network type, time of day, etc. The existing systems generally lack mechanisms to help the user understand and manage data consumption in view of the data usage plans.

As a result, with the existing systems, users can unknowingly exceed the allotted data caps and experience bandwidth throttling (e.g., a reduction or limit placed upon the rate of consumption) and/or be presented with a much larger than normal monthly bill, resulting in "bill shock." Throttling and bill shock can impact the user experience, leading to dissatisfied customers, increased customer service calls, and negative impressions of the mobile operators.

SUMMARY

Embodiments of the disclosure enable the collection and synchronization of data describing data usage plans and data usage statistics. A schema populated with data describing at least one data usage plan is received from at least one mobile operator. The data usage plan is associated with one or more user computing devices. The received, populated schema is distributed to the user computing devices. An updated portion of the schema is subsequently received from the mobile operator. The updated portion of the schema corresponds to an updated portion of the data usage plan. Only the received, updated portion of the schema is distributed to the user computing devices.

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exemplary block diagram illustrating a web service interacting with a mobile operator and user computing devices.

FIG. 2 is an exemplary flow chart illustrating operation of a web service to obtain and distribute data describing a data usage plan, or a portion thereof.

FIG. 3 is an exemplary flow chart illustrating operation of a computing device to collect and reconcile data usage statistics describing data consumed under a data usage plan.

FIG. 4 is an exemplary user interface illustrating configuration options for importing data describing a data usage plan.

FIG. 5 is an exemplary user interface illustrating synchronization of data describing a data usage plan.

FIG. 6 is an exemplary user interface illustrating a summary of network data usage with different types of network connections.

FIG. 7A is an exemplary user interface illustrating data usage by a mobile computing device consuming network data under a data usage plan with a monthly limit.

FIG. 7B is an exemplary user interface illustrating data usage by a mobile computing device consuming network data under a pay-as-you-go data usage plan.

FIG. 7C is an exemplary user interface illustrating data usage by a mobile computing device consuming network data under a data usage plan with unlimited data usage.

FIG. 8 is an exemplary block diagram illustrates a mobile computing device having a tile for displaying network data usage statistics to a user.

Corresponding reference characters indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

Referring to the figures, embodiments of the disclosure enable a centralized web service 108 to interact with user computing devices and mobile operators 111 to distribute data usage plans and to aggregate data usage statistics. For example, the web service 108 pulls information from the mobile operators 111 regarding customers (e.g., users 104) and pushes data usage plan changes or updates to a given user 104, segments of the users 104, or each of the users 104.

In some embodiments, the web service 108 receives a schema 116 populated with data relating to a data usage plan from the mobile operator 111 and distributes the populated schema 116 to one or more of the user computing devices. The data usage plan represents the terms and conditions (e.g., data consumption allotment) under which the mobile operator 111 provides data transfer services to the user computing devices. As the mobile operator 111 updates portions of the data usage plan, the web service 108 may receive and synchronize only the updated portions of the schema 116 with the user computing devices, in some embodiments. For example,

3

4

the web service **108** does not distribute the other portions of the schema **116** that were not updated.

The web service **108** may further generate, monitor, collect, and/or receive the data usage statistics from the mobile operators **111** and from one or more of the user computing devices. The data usage statistics represent an amount of data consumed by the user computing devices under the data usage plan. The web service **108** reconciles any differences in the received data usage statistics, and sends a synchronization notification to the user computing devices based on the reconciliation.

Referring to FIG. **1**, an exemplary block diagram illustrates the web service **108** interacting with the mobile operator **111** and user computing devices. The user computing devices include, for example, a mobile computing device **102** and other computing devices **106**. The user computing devices communicate over one or more networks **109**. In some embodiments, one or more of the user computing devices are associated with a data usage plan. For example, a plurality of the user computing devices may share data consumption allotted under the same or common data usage plan.

The user computing devices include any device executing instructions (e.g., as application programs, operating system functionality, or both) to implement operations and functionality. The user computing devices may include, for example, the mobile computing device **102** or any other portable device. In some embodiments, the mobile computing device **102** includes a mobile telephone (e.g., mobile telephone **404** in FIG. **4**), laptop, tablet, computing pad, netbook, gaming device, e-reader, and/or portable media player. The other computing devices **106** may include less portable devices such as desktop personal computers, kiosks, and tabletop devices that have network connectivity capabilities. Additionally, each user computing device may represent a group of processing units. While aspects of the disclosure may be described herein with reference to the mobile computing device **102**, the descriptions are applicable to any of the user computing devices.

Communication to/from the user computing devices may occur using any protocol or mechanism over one or more of the networks **109**. The networks **109** represent any infrastructure or other means for sending and/or receiving data. The networks **109** may include wired and/or wireless networks.

One or more of the mobile operators **111** communicate with the web service **108** and/or the user computing devices via the network **109**. Further, the user computing devices communicate with the web service **108**, or other entity that performs the operations described herein as being associated with the web service **108**. The web service **108** may further store, or have access to, a computer-executable schema component **122** and a computer-executable statistics component **124**. Operation of the schema component **122** and the statistics component **124**, when executed, is described below with reference to FIG. **2**.

For convenience in illustrating and describing FIG. **1**, the mobile computing device **102** and the other computing devices **106** are associated with a common data usage plan of the user **104**. For example, the mobile computing device **102** may represent the mobile telephone **404** of the user **104**, while the other computing devices **106** may include a tablet and a laptop associated with the user **104**.

In some embodiments, the mobile computing device **102** has at least one processor **110**, a memory area **112**, and at least one user interface (not shown). The processor **110** includes any quantity of processing units, and is programmed to execute computer-executable instructions for implementing aspects of the disclosure. The instructions may be performed by the processor **110** or by multiple processors executing within the mobile computing device **102**, or performed by a processor external to the mobile computing device **102**. In some embodiments, the processor **110** is programmed to execute instructions such as those illustrated in the figures (e.g., FIG. **3**).

In some embodiments, the processor **110** represents an implementation of analog techniques to perform the operations described herein. For example, the operations may be performed by an analog computing device and/or a digital computing device.

The mobile computing device **102** further has one or more computer readable media such as the memory area **112**. The memory area **112** includes any quantity of media associated with or accessible by the mobile computing device **102**. The memory area **112** may be internal to the mobile computing device **102** (as shown in FIG. **1**), external to the mobile computing device **102** (not shown), or both (not shown). In some embodiments, the memory area **112** includes read-only memory and/or memory wired into an analog computing device.

The memory area **112** stores, among other data, one or more applications **114**. The applications **114**, when executed by the processor **110**, operate to perform functionality on the mobile computing device **102**. Exemplary applications **114** include mail application programs, web browsers, calendar application programs, address book application programs, messaging programs, media applications, location-based services, search programs, and the like. The applications **114** may communicate with counterpart applications or services such as the web services **108** accessible via the network **109**. For example, the applications **114** may represent downloaded client-side applications that correspond to server-side services executing in a cloud.

The mobile computing device **102** further establishes and maintains one or more network connections **130** representing communication channels or other means for sending and/or receiving data over the network **109**. Exemplary network connections **130** include, but are not limited to, Wi-Fi, cellular, tethered, BLUETOOTH brand communication, near-field communication (NFC), and more. The network connections **130** may also be categorized into voice, text, data, or other categories or types of network traffic.

The memory area **112** further stores at least one schema **116**. The schema **116** represents the data usage plan associated with the user **104** of the mobile computing device **102**. For example, the user **104** has contracted with the mobile operator **111** to receive network data transfer services from the mobile operator **111**. The data usage plan describes the services provided by the mobile operator **111**, such as the amount of network data the user **104** can consume during a particular duration (e.g., a billing time period). For example, the data usage plan describes threshold values **118** associated with the network connections **130** of one or more devices of the user **104**. The threshold values **118** represent the maximum amount of data consumption allotted under the data usage plan for the network connections **130**. For example, one threshold value **118** may indicate the maximum amount of data consumption for a Wi-Fi connection, while another threshold value **118** indicates the maximum amount of data consumption for a cellular data connection.

The schema **116** may be defined by the web service **108**, by the mobile operator **111**, or by another entity. In general, the schema **116** enables descriptions of the parts, components, services, features, or other aspects of the data usage plan including, but not limited to, multi-rate data plans, peak times, roaming rates, allotted data consumption per network

connection **130**, etc. In some embodiments, the schema **116** allows the mobile operators **111** to send out updated portions of the schema **116** corresponding to updated parts of the data usage plan.

In some embodiments, the schema **116** includes a plurality of fields. Each of the threshold values **118** may be associated with one or more of the fields. For example, the fields may correspond to one or more of the following: peak times, off-peak times, peak time data consumption quota, off-peak time data consumption quota, peak time data consumption remaining, off-peak time data consumption remaining, a roaming rate and rules, a mobile operator name, a billing cycle type, a network connection type, identification of free hosts available for connection, a list of mobile hotspots, and any other elements or information pertaining to the data usage plan. The list of free hosts represents zero-rated or reduced cost hosts (e.g., visiting particular web sites does not count against the data usage plan).

The schema **116** may also include fields supporting different billing rates per host accessed, per weekend, per night, friends and family rates, peak and off-peak rates, and more. The schema **116** also allows each mobile operator **111** the flexibility to define complex plans including broadly offered plans, and dynamic, short-term offers to specific users **104** likely to use a specific part or parts of the overall services. Other offers based on any combination of the metrics obtained are available to the mobile operator **111**.

The schema **116** stored by the mobile computing device **102** may also include fields corresponding to data usage statistics collected, generated, or received by the mobile computing device **102** and/or the mobile operators **111**. For example, to facilitate sharing the data usage statistics among the mobile operators **111**, web service **108**, and/or user computing devices, the mobile operators **111**, web service **108**, and the user computing devices may populate the schema **116** with the data usage statistics.

While the schema **116** may take any form or structure, the schema **116** may be implemented as XML schema. Appendix A includes an exemplary XML schema for use in aspects of the disclosure.

The memory area **112** further stores exemplary computer-executable components such as a communications interface component **126** and a user interface component **128**. In some embodiments, the communications interface component **126** includes a network interface card and/or computer-executable instructions (e.g., a driver) for operating the network interface card. In some embodiments, the communications interface is operable with near-field communication (NFC) tags.

The user interface component **128** may include a graphics card for displaying data to the user **104** and receiving data from the user **104**. The user interface component **128** may also include computer-executable instructions (e.g., a driver) for operating the graphics card. Further, the user interface component **128** may include a display (e.g., a touch screen display or natural user interface) and/or computer-executable instructions (e.g., a driver) for operating the display. The user interface component **128** may also include one or more of the following to provide data to the user **104** or receive data from the user **104**: speakers, a sound card, a camera, a microphone, a vibration motor, one or more accelerometers, a BLUE-TOOTH brand communication module, global positioning system (GPS) hardware, and a photoreceptive light sensor. For example, the user **104** may input commands or manipulate data by moving the computing device in a particular way.

Referring next to FIG. **2**, an exemplary flow chart illustrates operation of the web service **108** to obtain and distribute

data describing a data usage plan, or a portion thereof. While the operations illustrated in FIG. **2** are performed by the web service **108** in some embodiments, one or more of the operations may be performed by other devices, including any computing device local to, or remote from, the user **104**. For example, the operations may be performed by a proxy device in communication with the web service **108**. Alternatively or in addition, the operations illustrated in FIG. **2** may be performed by an operating system executing on the mobile computing device **102**.

At **202**, the web service **108** receives, from at least one of the mobile operators **111**, the schema **116** populated with data describing the data usage plan associated with one or more of the user computing devices. At **204**, the web service **108** distributes the received, populated schema **116** to the user computing devices. Subsequently, the web service **108** may receive at **206** an updated portion of the schema **116** from the mobile operator **111**. The updated portion of the schema **116** corresponds to an updated portion of the data usage plan. For example, the mobile operator **111** may update one or more of the following: roaming agreements, fallback plans, free hosts, mobile hotspots, and any other element and information pertaining to the user's data plan that has an impact on data usage, cost, and/or tariff.

The web service **108** distributes only the received, updated portion of the schema **116** to the user computing devices at **208**. In this manner, the mobile operator **111** is able to update portions of the data usage plan and push only those updated portions (e.g., not the entire data usage plan) to subscribers (e.g., user **104**), thus reducing the amount of network data consumed. In embodiments in which there are multiple updated portions of the schema **116**, the web service **108** may decide to distribute the updated portions in separate batches, such as at different times or during particular time intervals. In this manner, the web service **108** is able to take advantage of reduced cost network transfers (e.g., off-peak times) to reduce or at least manage the network data consumption of the user computing devices.

Rather than distributing the populated schema **116** or portions thereof, the web service **108** may send a notification to the user computing devices to synchronize their version of the populated schema **116** with that of the web service **108**. In such embodiments, upon receipt of the notification from the web service **108**, one or more of the user computing devices may send a synchronization request to the web service **108**. Upon receipt of the synchronization request, the web service **108** provides the populated schema **116** or updated portions of the schema **116** to the requesting user computing devices.

In some embodiments, the web service **108** may store, or have access to, one or more computer-executable components for implementing one or more of the operations illustrated in FIG. **2**. For example, the schema component **122**, when executed by the web service **108**, receives from the mobile operator **111** the schema populated with data describing the data usage plan associated with one or more of the user computing devices. The schema component **122** distributes the received, populated schema to the user computing device. Subsequently, the web service **108** receives, from the mobile operator **111**, an updated portion of the schema **116**. The updated portion of the schema **116** corresponds to an updated portion of the data usage plan (e.g., as updated by the mobile operator **111** such as when changing terms of the data usage plan). The schema component **122** then distributes only the received, updated portion of the schema **116** to the user computing device.

In some embodiments, the web service **108** may further collect, reconcile, and distribute data usage statistics to the

user computing devices. The data usage statistics may be viewed as a current or instant snapshot of the amount of data transmitted and/or received (e.g., consumed) by the computing devices of the user **104** that share the data usage plan. The web service **108** may collect information relating to text messages, data, voice calls, minutes used, voice over Internet Protocol (VoIP) usage, and any other element of usage consumed by, or that impacts, the user computing devices to produce the data usage statistics. The data usage statistics identify, to a granularity of time (e.g., per minute) or data (e.g., per kilobyte), how much data has been sent and/or received by the mobile computing device **102** or other user computing devices and over which network connections **130**. Other data usage statistics are contemplated, however. For example, the data usage statistics may further identify the time and day of usage, location of usage, network connection **130**, technology usage, the subscriber identity module (SIM) card or other user identity module used for dual SIM scenarios, the international mobile station equipment identity (IMEI) or other device identifier for multi-device scenarios, the Internet protocol (IP) address or other address of the access point used for Wi-Fi scenarios, the IP address or other address of the target computer (e.g., for whitelist/blacklists in data usage), the application responsible for the data transfer, etc. In some examples, the web service **108** tracks or monitors network data consumption by the user computing devices by compiling the data usage statistics directly (e.g., monitor network traffic) and/or by collecting the data usage statistics from the mobile computing device **102** (or other user computing devices) and/or the mobile operator **111**.

For example, the web service **108** may collect, monitor, or generate first data usage statistics **120** from the mobile computing device **102** and second data usage statistics **132** from the mobile operator **111**. In some embodiments, the first data usage statistics **120** represent network data consumed under the data usage plan by the mobile computing device **102** as determined and/or measured (e.g., collected and stored) by the mobile computing device **102**. For example, the mobile computing device **102** collects ongoing usage data relating to network data transfers, such as from device radios, drivers, and accelerometers.

In other embodiments, the first data usage statistics **120** represent network data consumed under the data usage plan by each of the user computing devices, not just the mobile computing device **102**. In such embodiments, the mobile computing device **102** receives updates of network data consumption by the other user computing devices sharing the same data usage plan. The second data usage statistics **132** represent network data consumed under the data usage plan by the mobile computing device **102** as determined and/or measured (e.g., collected and stored) by the mobile operator **111**. In other embodiments, the second data usage statistics **132** represent network data consumed under the data usage plan by each of the user computing devices, not just the mobile computing device **102**. In such embodiments, the mobile operator **111** monitors network data consumption by the other user computing devices sharing the same data usage plan. For example, the second data usage statistics **132** may represent the network data collectively consumed by the mobile telephone **404**, tablet, and laptop of the user **104**.

In a further example, one or more of the mobile operators **111** collect data usage statistics corresponding to a plurality of data usage plans. In such an example, there may a plurality of sets of data usage statistics (e.g., one set for each data usage plan or user **104**).

In some embodiments, the mobile operator **111** may have more current and/or more accurate data usage statistics **120**

for one or more of the user computing devices than the user computing devices. For example, the mobile operator **111** may have more current and/or more accurate data usage statistics **120** for particular network connections **130** than the user computing devices. The mobile operator **111** may push, or transmit upon demand, such data usage statistics **120** to the web service **108**. The web service **108** integrates or otherwise reconciles the data from the mobile operator **111** and/or the user computing devices to produce the data usage statistics **120**.

For example, if differences exist in the data usage statistics received from the mobile computing device **102** and from the mobile operator **111** (e.g., the data from the mobile operator **111** may be 24-48 hours old), the web service **108** reconciles the differences to provide the user **104** with the most current information. Reconciling the differences includes, for example, examining time stamps or other collection dates and favoring, weighting, or choosing the more recently collected data. For example, the web service **108** may compare a timestamp associated with the first data usage statistics **120** and a timestamp associated with the second data usage statistics **132** to determine which of the data usage statistics is more recent or up-to-date. Based on the reconciling, the web service **108** may send a notification to one or more of the user computing devices. In such embodiments, upon receipt of the notification from the web service **108**, one or more of the user computing devices may send a synchronization request to the web service **108**. For example, the web service **108** identifies those user computing devices that have outdated data usage statistics.

Upon receipt of the synchronization request from the user computing devices, the web service **108** provides the most recent or up-to-date data usage statistics to those requesting user computing devices. For example, the web service **108** may provide the second data usage statistics **132** (e.g., from the mobile operator **111**) to the requesting user computing devices.

In some embodiments, the web service **108** executes the statistics component **124** to collect and analyze the data usage statistics. The statistics component **124**, when executed by the web service **108**, receives the first data usage statistics **120** as collected by the user computing device and the second data usage statistics **132** as collected by the mobile operator **111**. The statistics component **124** reconciles the first data usage statistics **120** and the second data usage statistics **132**, and sends a synchronization notification to the user computing device based on the reconciliation. For example, if the statistics component **124** determines that the first data usage statistics **120** collected or maintained by the user computing device is out-of-date, the web service **108** sends the synchronization notification to the user computing device. In response to receiving the synchronization notification, the user computing device synchronizes the first data usage statistics **120** with the second data usage statistics **132** (e.g., compares timestamps associated with the first data usage statistics **120** and the second data usage statistics **132**). For example, the user computing device may replace the first data usage statistics **120** with the second data usage statistics **132**.

The web service **108** may store the schema component **122** and the statistics component **124** on one or more computer storage media. Further, the schema component **122** and the statistics component **124** may execute independently of each other (e.g., not sequentially, or without interaction or dependency between the two components). For example, the schema component **122** and the statistics component **124** may each be executed by a separate thread.

Referring next to FIG. 3, an exemplary flow chart illustrates operation of a computing device such as the mobile computing device 102 to collect and reconcile data usage statistics describing network data consumed under the data usage plan. While the operations illustrated in FIG. 3 are performed by the computing device of the user 104 in some embodiments, one or more of the operations may be performed by other devices, including any computing device local to, or remote from, the user 104. For example, the operations may be performed by a proxy device in communication with the computing device. As an example, the operations illustrated in FIG. 3 may be performed by an operating system executing on the mobile computing device 102.

At 302, the computing device collects data usage statistics (e.g., the first data usage statistics 120) relating to the data usage plan. The first data usage statistics 120 represent network data consumption under the data usage plan by the computing device as determined by the computing device. The computing device stores the collected first data usage statistics 120 in, for example, the memory area 112. At 304, the computing device receives data usage statistics (e.g., the second data usage statistics 132) relating to the data usage plan. The second data usage statistics 132 represent network data consumption under the data usage plan by the computing device as determined by the mobile operator 111.

At 306, the computing device reconciles the collected first data usage statistics 120 and the received second data usage statistics 132. For example, the computing device may compare timestamps associated with the first data usage statistics 120 and the second data usage statistics 132 to identify the more recent, or up-to-date, measure of network data consumption under the data usage plan. At 308, the computing device updates the first data usage statistics 120 based on the reconciliation. For example, the computing device may conclude that the first data usage statistics 120 are more recent and hence more accurately represent current, cumulative network data consumption than the second data usage statistics 132. In such an example, the computing device makes no changes to the collected first data usage statistics 120.

As another example, the computing device may conclude that the second data usage statistics 132 are more recent and hence more accurately represent current, cumulative network data consumption than the first data usage statistics 120. In such an example, the computing device may replace the first data usage statistics 120 stored in the memory area 112 with the second data usage statistics 132.

As described with reference to FIG. 3, the first data usage statistics 120 represent network data consumed by the computing device, as monitored by the computing device. In other embodiments, the first data usage statistics 120 may represent network data consumed by the computing device and the other computing devices 106 sharing the data usage plan. For example, the computing device may collect the first data usage statistics 120 by receiving at least a portion of the first data usage statistics 120 from these other computing devices 106 associated with the data usage plan. In such embodiments, after reconciling the data usage statistics (e.g., updating the first data usage statistics 120 with the second data usage statistics 132), the computing device may send the updated first data usage statistics 120 to the other computing devices 106 based on the reconciliation. Alternatively or in addition, the computing device may send a synchronization notification to the other computing devices 106 prompting those computing devices to synchronize the data usage statistics with those from the computing device.

Referring next to FIG. 4, an exemplary user interface 402 on the mobile telephone 404 illustrates configuration options for importing data describing the data usage plan. In the example of FIG. 4, the user 104 is able to explicitly opt-in or opt-out of receiving the schema 116 populated with the data usage plan. For example, the mobile telephone 404 asks permission from the user 104 to retrieve the wireless plan details to help avoid overcharges. The user 104 checks a checkbox to import the populated schema 116. In response, the mobile telephone 404 requests the populated schema 116 from the mobile operator 111 and, upon receipt from the mobile operator 111, the mobile telephone 404 stores the populated schema 116 in the memory area 112.

Referring next to FIG. 5, an exemplary user interface 502 illustrates completion of synchronization of data describing the data usage plan. In the example of FIG. 5, the user 104 has opted-in to obtaining, from the mobile operator 111, the schema 116 populated with the data usage plan that the user 104 and mobile operator 111 have agreed upon. The user 104 receives confirmation that the details of the data usage plan have been downloaded, as displayed in the user interface 502 of the mobile telephone 404. The populated schema 116 includes details of the data usage plan, such as the start date of the billing cycle. The user interface 502 in FIG. 5 further displays the start date of the billing cycle to the user 104. The user interface 502 also displays a message telling the user 104 how to check current usage and modify account settings.

Referring next to FIG. 6, an exemplary user interface 602 illustrates a summary of network data usage with different types of network connections 130. While the proportions of the user interfaces 602, 702, 704, 706 illustrated in FIG. 6, FIG. 7A, FIG. 7B, FIG. 7C, and FIG. 8 are shown to conform to a screen of the mobile computing device 102 (e.g., the mobile telephone 404), the content displayed within the user interfaces 602, 702, 704, 706 may be shown in any format on any of the user computing devices.

In FIG. 6, data usage for a plurality of the network connections 130 is shown to the user 104 in the user interface 602. In particular, data usage statistics 120 attributed to each of the network connections 130 is shown. For example, the amounts of data transmitted and/or received over a cellular network connection, a tethered network connection, a Hotspot network connection, and a Wi-Fi network connection are shown. The amounts of data are represented by proportionally-sized horizontal bars.

The user interface 602 also displays the threshold values 118 associated with each of the network connections 130. The threshold values 118 are taken from the data usage plan. For example, the data usage plan indicates that the user 104 has a maximum of 5 gigabytes (GB) of data usage available for the cellular network connection, 2 GB of data usage for the tethered network connection, 1 GB of data usage for the Hotspot network connection, and an unlimited amount of data usage for the Wi-Fi network connection.

The user interface 602 in FIG. 6 may also display a button or bar that, when selected by the user 104 (e.g., clicked or touched), the user interface 602 allows the user 104 to select options or other configuration settings for receiving notifications. The notifications are sent when the amounts of data transmitted and/or received over the various network connections 130 reaches particular values (e.g., set by the user 104, mobile computing device 102, mobile operator 111, or other entity).

Referring next to FIG. 7A, an exemplary user interface 702 illustrates data usage by the mobile computing device 102 consuming network data under the data usage plan having a monthly limit. While the overviews of data usage illustrated

in FIG. 7A, FIG. 7B, and FIG. 7C indicate that the data usage statistics 120 shown are per application 114, the user interfaces 702, 704, 706 may alternatively or in addition display an overview of aggregated data usage across the applications 114 on the mobile computing device 102. Further, the user interfaces 702, 704, 706 may alternatively or in addition display an overview of data usage per computing device of the user 104 or aggregated across a plurality of the computing devices of the user 104. For example, the different statistics may be shown in different tabs or tiles in the user interfaces 702, 704, 706. In an example involving a family or shared data plan, the statistics for each plan member may be shown in separate tiles.

In FIG. 7A, the data usage statistics 120 include the amount of network data remaining for use (e.g., the remainder of the monthly limit specified by the data usage plan), the amount of network data used during the current billing period, and the quantity of time (e.g., days) remaining within the current billing period. The data usage statistics 120 also indicate a breakout of the data usage, such as the amount of data consumed under a cellular network connection versus the amount of data consumed under a Wi-Fi network connection.

Referring next to FIG. 7B, an exemplary user interface 704 illustrates data usage by the mobile computing device 102 consuming network data under a pay-as-you-go data usage plan. In FIG. 7B, the data usage statistics 120 include the amount of network data consumption remaining for use (e.g., the remainder of the pay-as-you-go amount specified by the data usage plan), the amount of network data consumed recently (e.g., within the last 30 days), and the quantity of time (e.g., days) remaining. For example, the remaining cellular data consumption expires in 16 days. The data usage statistics 120 also indicate a breakout of the data usage, such as the amount of data consumed under a cellular network connection versus the amount of data consumed under a Wi-Fi network connection.

Referring next to FIG. 7C, an exemplary user interface 706 illustrates data usage by the mobile computing device 102 consuming network data under the data usage plan with unlimited data usage. In FIG. 7C, the data usage statistics 120 include the amount of network data consumed recently (e.g., within the last 30 days). The data usage statistics 120 also indicate a breakout of the data usage, such as the amount of data consumed under a cellular network connection versus the amount of data consumed under a Wi-Fi network connection. The data usage statistics 120 also indicate a total amount of usage by the mobile computing device 102.

Referring next to FIG. 8, an exemplary block diagram illustrates the mobile computing device 102 as the mobile telephone 404 having a tile for displaying the data usage statistics 120 to the user 104. The mobile telephone 404 displays a plurality of tiles (e.g., active tiles) that may be updated with the data usage statistics 120. In some embodiments, tiles represent tile user interface elements. In the example of FIG. 8, the mobile telephone 404 indicates that 78% of the allotment for text messages has been consumed, while 55% of the allotment for data usage has been consumed.

Additional Examples

In an example scenario, the user 104 has several user computing devices associated with the same data usage plan. For example, the user 104 has a smartphone, a tablet, and a basic cellular telephone. In this example, the user 104 also has two subscriber identity module (SIM) cards or other user identity modules (e.g., two universal integrated circuit cards), each associated with a different data usage plan. Over time, the user 104 moves the SIM cards among the smartphone, tablet,

and cellular telephone. After the user 104 installs one of the SIM cards in one of the devices, aspects of the disclosure execute on that device to detect the new SIM card and to communicate with the mobile operator 111 associated with the SIM card to obtain the schema 116 populated with the data usage plan associated with the SIM card. The user 104 is then able to view details of the data usage plan associated with that SIM card, such as the allotments per network connection 130 and remaining data consumption for the current billing cycle.

In another example scenario, the computing device may share the populated schema 116, or portions thereof, with other devices upon demand or request. For example, the user 104 may tether the computing device to a friend's computing device (e.g., configure the computing device to be a wireless access point). The friend's computing device communicates with the user's computing device to obtain the schema 116 populated with the data usage plan. The friend is then able to view an amount of data consumption remaining under the data usage plan associated with the user 104 thus enabling the friend to decide whether, and how much, network data may be consumed.

At least a portion of the functionality of the various elements in FIG. 1 may be performed by other elements in FIG. 1, or an entity (e.g., processor, web service, server, application program, computing device, etc.) not shown in FIG. 1.

In some embodiments, the operations illustrated in FIG. 2 and FIG. 3 may be implemented as software instructions encoded on a computer readable medium, in hardware programmed or designed to perform the operations, or both. For example, aspects of the disclosure may be implemented as a system on a chip or other circuitry including a plurality of interconnected, electrically conductive elements.

The term "roaming" as used herein refers, in some embodiments, to connectivity provided outside a subscriber's home zone that may be subject to additional tariffs, fees, or constraints. Roaming service may or may not be provided by the same mobile operator 111. The term "tethered" as used herein refers, in some embodiments, to situations where one device acts as an access point for another device for network access. A tethered connection may occur over a wired connection or a wireless connection. The term "Wi-Fi" as used herein refers, in some embodiments, to a wireless local area network using high frequency radio signals for the transmission of data. The term "BLUETOOTH" as used herein refers, in some embodiments, to a wireless technology standard for exchanging data over short distances using short wavelength radio transmission. The term "cellular" as used herein refers, in some embodiments, to a wireless communication system using short-range radio stations that, when joined together, enable the transmission of data over a wide geographic area. The term "NFC" as used herein refers, in some embodiments, to a short-range high frequency wireless communication technology for the exchange of data over short distances.

Embodiments have been described with reference to data monitored and/or collected from users 104. In some embodiments, notice may be provided to the users 104 of the collection of the data (e.g., via a dialog box or preference setting) and users 104 are given the opportunity to give or deny consent for the monitoring and/or collection. The consent may take the form of opt-in consent or opt-out consent.

Exemplary Operating Environment

Exemplary computer readable media include flash memory drives, digital versatile discs (DVDs), compact discs (CDs), floppy disks, and tape cassettes. By way of example and not limitation, computer readable media comprise computer storage media and communication media. Computer storage media include volatile and nonvolatile, removable

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and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules or other data. Computer storage media are tangible and are mutually exclusive to communication media. Computer storage media are implemented in hardware. Exemplary computer storage media include hard disks, flash drives, and other solid-state memory. In contrast, communication media typically embody computer readable instructions, data structures, program modules, or other data in a modulated data signal such as a carrier wave or other transport mechanism and include any information delivery media.

Although described in connection with an exemplary computing system environment, embodiments of the disclosure are capable of implementation with numerous other general purpose or special purpose computing system environments, configurations, or devices.

Examples of well-known computing systems, environments, and/or configurations that may be suitable for use with aspects of the invention include, but are not limited to, mobile computing devices, personal computers, server computers, hand-held or laptop devices, multiprocessor systems, gaming consoles, microprocessor-based systems, set top boxes, programmable consumer electronics, mobile telephones, network PCs, minicomputers, mainframe computers, distributed computing environments that include any of the above systems or devices, and the like. Such systems or devices may accept input from the user 104 in any way, including from input devices such as a keyboard or pointing device, via gesture input, and/or via voice input.

Embodiments of the invention may be described in the general context of computer-executable instructions, such as program modules, executed by one or more computers or other devices. The computer-executable instructions may be organized into one or more computer-executable components or modules. Generally, program modules include, but are not limited to, routines, programs, objects, components, and data structures that perform particular tasks or implement particular abstract data types. Aspects of the invention may be implemented with any number and organization of such components or modules. For example, aspects of the invention are not limited to the specific computer-executable instructions or the specific components or modules illustrated in the figures and described herein. Other embodiments of the invention may include different computer-executable instructions or components having more or less functionality than illustrated and described herein.

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Aspects of the invention transform a general-purpose computer into a special-purpose computing device when configured to execute the instructions described herein.

The embodiments illustrated and described herein as well as embodiments not specifically described herein but within the scope of aspects of the invention constitute exemplary means for collecting and reconciling the first data usage statistics 120 (e.g., as collected by the user computing devices) and the second data usage statistics 132 (e.g., as collected by the mobile operators 111), and exemplary means for synchronizing the first data usage statistics 120 with the second data usage statistics 132.

The order of execution or performance of the operations in embodiments of the invention illustrated and described herein is not essential, unless otherwise specified. That is, the operations may be performed in any order, unless otherwise specified, and embodiments of the invention may include additional or fewer operations than those disclosed herein. For example, it is contemplated that executing or performing a particular operation before, contemporaneously with, or after another operation is within the scope of aspects of the invention.

When introducing elements of aspects of the invention or the embodiments thereof, the articles "a," "an," "the," and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. The term "exemplary" is intended to mean "an example of" The phrase "one or more of the following: A, B, and C" means "at least one of A and/or at least one of B and/or at least one of C."

Having described aspects of the invention in detail, it will be apparent that modifications and variations are possible without departing from the scope of aspects of the invention as defined in the appended claims. As various changes could be made in the above constructions, products, and methods without departing from the scope of aspects of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Appendix A

Listed below are exemplary schema portions that are operable in aspects of the disclosure. While written in extensible markup language (XML) format, the schema may be implemented in other formats.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="Base/v1"
elementFormDefault="qualified"
targetNamespace="CarrierControl/Base/v1">
    <!-- Basic types -->
    <xs:simpleType name="NameType">
        <xs:restriction base="xs:normalizedString">
            <xs:minLength value="1"/>
            <xs:maxLength value="255"/>
            <xs:whiteSpace value="collapse"/>
        </xs:restriction> </xs:simpleType>
    <xs:simpleType name="Priority">
        <xs:restriction base="xs:nonNegativeInteger">
            <xs:maxExclusive value="10"/>
        </xs:restriction>
    </xs:simpleType>
    <xs:simpleType name="GUID">
        <xs:annotation>
            <xs:documentation xml:lang="en"> The representation of a GUID,
generally the id of an element. </xs:documentation>
        </xs:annotation>
```

```
    <xs:restriction base="xs:token">
        <xs:pattern value="\{[a-fA-F0-9]{8}-[a-fA-F0-9]{4}-[a-fA-F0-9]{4}-[a-
fA-F0-9]{4}-[a-fA-F0-9]{12}\}"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="SubscriberType">
    <xs:restriction base="xs:token">
        <xs:maxLength value="20"/>
        <xs:pattern value="\w+"/>
    </xs:restriction>
</xs:simpleType>
<xs:complexType name="CertificateDetails">
    <xs:annotation>
        <xs:documentation> Used to identify a certificate or set of certificates.
SubjectName is compared against the DN provided as the certificate's Subject field, or
against any Name provided in the SubjectAlternativeName extentions of type
DirectoryName. IssuerName is compared against the DN provided as the certificate's
Issuer field, or against any Name provided in the IssuerAlternativeName extentions of
type DirectoryName. </xs:documentation>
    </xs:annotation>
    <xs:sequence>
        <xs:element name="SubjectName" type="xs:string"/>
        <xs:element name="IssuerName" type="xs:string"/>
    </xs:sequence>
</xs:complexType>
    <!-- Alias definitions -->
<xs:element name="AliasList">
    <xs:complexType>
        <xs:sequence>
            <xs:element maxOccurs="unbounded" ref="AliasDefinition"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:complexType name="AliasDefinitionBaseType">
    <xs:attribute name="Name" type="xs:string"/>
</xs:complexType>
<xs:element name="AliasDefinition" type="AliasDefinitionBaseType"
abstract="true"/>
    <!-- Locations -->
<xs:simpleType name="ProviderNameType">
    <xs:restriction base="xs:normalizedString">
        <xs:minLength value="1"/>
        <xs:maxLength value="20"/>
        <xs:whiteSpace value="collapse"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="ProviderIdType">
    <xs:restriction base="xs:token">
        <xs:pattern value="\d{1,6}"/>
    </xs:restriction>
</xs:simpleType>
<xs:complexType name="ProviderType">
    <xs:sequence>
        <xs:element name="ProviderID" type="ProviderIdType"/>
        <xs:element name="ProviderName" type="ProviderNameType"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="LocationType">
    <xs:choice maxOccurs="unbounded">
        <xs:element name="Provider" type="ProviderType"/>
        <xs:element name="LocationAlias" type="xs:string"/>
    </xs:choice>
    <xs:attribute name="negate" type="xs:boolean" default="false"/>
</xs:complexType>
<xs:element name="LocationAliasDefinition"
type="LocationAliasDefinitionType" substitutionGroup="AliasDefinition"/>
<xs:complexType name="LocationAliasDefinitionType">
    <xs:complexContent>
        <xs:extension base="AliasDefinitionBaseType">
            <xs:sequence>
                <xs:element name="Location" type="LocationType"/>
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
    <!-- Times -->
<xs:complexType name="TimeType">
    <xs:choice maxOccurs="unbounded">
```

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```
        <xs:element name="TimePeriod" type="TimePeriod"/>
        <xs:element name="RecurringTimePeriod"
type="RecurringTimePeriod"/>
        <xs:element name="TimeAlias" type="xs:string"/>
      </xs:choice>
      <xs:attribute name="negate" type="xs:boolean" default="false"/>
    </xs:complexType>
    <xs:element name="TimeAliasDefinition" type="TimeAliasDefinitionType"
substitutionGroup="AliasDefinition"/>
    <xs:complexType name="TimeAliasDefinitionType">
      <xs:complexContent>
        <xs:extension base="AliasDefinitionBaseType">
          <xs:sequence>
            <xs:element name="Time" type="TimeType"
maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
    <xs:simpleType name="TimeOfWeek">
      <xs:annotation>
        <xs:documentation> Defines a time as an offset from the midnight
preceding 12:00:01 AM Sunday (P0D) to the midnight following 11:59:59 PM
Saturday (P7D). </xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:duration">
        <xs:minInclusive value="P0D"/>
        <xs:maxInclusive value="P7D"/>
      </xs:restriction>
    </xs:simpleType>
    <xs:complexType name="RecurringTimePeriod">
      <xs:annotation>
        <xs:documentation> Defines a period of time within the week as a
start/end TimeOfWeek. If EndTime is less than StartTime, the period is interpreted as
crossing Saturday night. </xs:documentation>
      </xs:annotation>
      <xs:attribute name="StartTime" type="TimeOfWeek" use="required"/>
      <xs:attribute name="EndTime" type="TimeOfWeek" use="required"/>
    </xs:complexType>
    <xs:complexType name="TimePeriod">
      <xs:annotation>
        <xs:documentation> Defines a period of time as a start/end date and time.
</xs:documentation>
      </xs:annotation>
      <xs:attribute name="StartTime" type="xs:dateTime" use="required"/>
      <xs:attribute name="EndTime" type="xs:dateTime" use="required"/>
    </xs:complexType>
</xs:schema>
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:base="Base/v1"
elementFormDefault="qualified"
targetNamespace=" CarrierControl/Plans/v1">
    <xs:import schemaLocation="Alias.xsd"
      namespace="CarrierControl/Base/v1"/>
    <!-- Plan Definition -->
    <xs:complexType name="BillingCycleType">
      <xs:attribute name="StartDate" use="required" type="xs:dateTime"/>
      <xs:attribute name="Duration" use="required">
        <xs:simpleType>
          <xs:restriction base="xs:duration">
            <xs:minExclusive value="PT0S"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:attribute>
      <xs:attribute name="Resets" type="xs:boolean" default="true"/>
    </xs:complexType>
    <xs:simpleType name="CostStyleType">
      <xs:annotation>
        <xs:documentation> CostType expresses the incremental cost of a plan: -
Unrestricted: There is no incremental cost for consumption on this plan - Fixed:
Consumption goes against a quota which the user has purchased / agreed to purchase -
Variable: The user will be billed for incremental usage on this plan
</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:string">
        <xs:enumeration value="Unrestricted"/>
        <xs:enumeration value="Fixed"/>
        <xs:enumeration value="Variable"/>
      </xs:restriction>
```

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```
</xs:simpleType>
<xs:element name="Plan">
   <xs:complexType>
      <xs:sequence>
         <xs:element minOccurs="0" ref="Description"/>
         <xs:element minOccurs="0" ref="Usage"/>
      </xs:sequence>
      <xs:attribute name="Name" use="required" type="xs:string"/>
   </xs:complexType>
</xs:element>
<xs:element name="Description" type="DescriptionBaseType" abstract="true"/>
<xs:complexType name="DescriptionBaseType">
   <xs:sequence>
      <xs:element name="BillingCycle" type="BillingCycleType"
minOccurs="0"/>
      <xs:element name="Conditions" minOccurs="0">
         <xs:complexType>
            <xs:all>
               <xs:element name="Location" type="base:LocationType"
minOccurs="0"/>
               <xs:element name="Time" type="base:TimeType"
minOccurs="0"/>
               <xs:element name="Direction" default="inout"
minOccurs="0">
                  <xs:simpleType>
                     <xs:restriction base="xs:token">
                        <xs:enumeration value="in"/>
                        <xs:enumeration value="out"/>
                        <xs:enumeration value="inout"/>
                     </xs:restriction>
                  </xs:simpleType>
               </xs:element>
               <xs:element name="Destination" minOccurs="0">
                  <xs:complexType>
                     <xs:annotation>
                        <xs:documentation> PhoneNumber only applies to
SMS/Voice plans; HostName only applies to data plans </xs:documentation>
                     </xs:annotation>
                     <xs:sequence>
                        <xs:element name="PhoneNumber"
minOccurs="0">
                           <xs:simpleType>
                              <xs:restriction base="xs:string">
                                 <xs:pattern value="(\+)?\d+"/>
                              </xs:restriction>
                           </xs:simpleType>
                        </xs:element>
                        <xs:element name="HostName" minOccurs="0">
                           <xs:simpleType>
                              <xs:restriction base="xs:anyURI"/>
                           </xs:simpleType>
                        </xs:element>
                     </xs:sequence>
                  </xs:complexType>
               </xs:element>
               <xs:element name="LimitedUsage" minOccurs="0">
                  <xs:annotation>
                     <xs:documentation> For Fixed plans, provides details
on the user's quota: - Limit: The amount of the quota (in minutes for Voice plans,
megabytes for Data plans, and messages for SMS plans) - SharedPlan: Another plan
name whose quota is also consumed by usage on this plan - FallbackPlan: Another
plan name whose consumption begins when this quota is exhausted. If a Fallback Plan
is not provided, the current plan goes into an Overage state. </xs:documentation>
                  </xs:annotation>
                  <xs:complexType>
                     <xs:attribute name="Limit" use="required"
type="xs:nonNegativeInteger"/>
                     <xs:attribute name="SharedPlan" type="xs:string"/>
                     <xs:attribute name="FallbackPlan" type="xs:string"/>
                  </xs:complexType>
               </xs:element>
            </xs:all>
         </xs:complexType>
      </xs:element>
   </xs:sequence>
   <xs:attribute name="CostStyle" use="required" type="CostStyleType"/>
</xs:complexType>
<xs:complexType name="DataPlanDescriptionType">
   <xs:complexContent>
```

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```
    <xs:extension base="DescriptionBaseType">
        <xs:sequence>
            <xs:element name="BandwidthInKbps"
type="xs:nonNegativeInteger" minOccurs="0"/>
            <xs:element name="MaxDownloadFileSizeInMegabytes"
type="xs:positiveInteger" default="25" minOccurs="0"/>
                <xs:element name="SecurityUpdatesExempt" type="xs:boolean"
default="false" minOccurs="0"/>
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:element name="DataPlanDescription" type="DataPlanDescriptionType"
substitutionGroup="Description"/>
<xs:complexType name="SmsPlanDescriptionType">
    <xs:complexContent>
        <xs:extension base="DescriptionBaseType"/>
    </xs:complexContent>
</xs:complexType>
<xs:element name="SmsPlanDescription" type="SmsPlanDescriptionType"
substitutionGroup="Description"/>
<xs:complexType name="VoicePlanDescriptionType">
    <xs:complexContent>
        <xs:extension base="DescriptionBaseType"/>
    </xs:complexContent>
</xs:complexType>
<xs:element name="VoicePlanDescription" type="VoicePlanDescriptionType"
substitutionGroup="Description"/>
<xs:element name="Usage" type="PlanUsageType"/>
<xs:complexType name="PlanUsageType">
    <xs:attribute name="PlanName" use="required" type="xs:string"/>
    <xs:attribute name="OverLimit" type="xs:boolean"/>
    <xs:attribute name="Congested" type="xs:boolean"/>
    <xs:attribute name="CurrentUsage" use="required"
type="xs:nonNegativeInteger"/>
    <xs:attribute name="UsageTimestamp" use="required" type="xs:dateTime"/>
</xs:complexType>
</xs:schema>
```

What is claimed is:

1. A system comprising:

a memory area associated with a mobile computing device, said memory area storing first data usage statistics, the first data usage statistics representing network data consumed by the mobile computing device under a data usage plan; and

a processor programmed to:

collect the first data usage statistics relating to the data usage plan and store the collected first data usage statistics in the memory area;

receive second data usage statistics relating to the data usage plan as collected by a mobile operator;

reconcile differences between the collected first data usage statistics and the received second data usage statistics, the reconciliation determining which of the collected first data usage statistics and the received second data usage statistics is a more up-to-date measure of the network data consumption under the data usage plan, wherein the reconciliation is performed based on the differences before generating a synchronization notification to update the first data usage statistics; and

update the first data usage statistics stored in the memory area based on the reconciliation, wherein the first data usage statistics are not updated when the collected first data usage statistics are more up-to-date than the received second data usage statistics.

2. The system of claim 1, wherein the processor is programmed to collect the first data usage statistics by receiving at least a portion of the first data usage statistics from other computing devices associated with the same data usage plan,

wherein the collected first data usage statistics are updated when the received second data usage statistics are more up-to-date than the collected first data usage statistics.

3. The system of claim 2, wherein the processor is further programmed to send the updated first data usage statistics to the other computing devices based on the reconciliation.

4. The system of claim 2, wherein the processor is further programmed to send the synchronization notification to only the other computing devices that share the same data usage plan and have outdated first data usage statistics, based on the reconciliation, wherein the other computing devices that share the same data usage plan obtain the updated first data statistics by sending a synchronization request, after the reconciliation in response to the synchronization notification.

5. The system of claim 1, further comprising means for collecting and reconciling the first data usage statistics and the second data usage statistics.

6. The system of claim 1, further comprising means for synchronizing the first data usage statistics with the second data usage statistics.

7. A method comprising:

collecting, by a processor, first data usage statistics related to a data usage plan and store the collected first data usage statistics in a memory area;

receiving, by the processor, second data usage statistics related to the data usage plan as collected by a mobile operator;

reconciling, by the processor, differences between the collected first data usage statistics and the received second data usage statistics, the reconciliation determining which of the collected first data usage statistics and the received second data usage statistics is a more up-to-date

measure of the network data consumption under the data usage plan, wherein the reconciliation is performed based on the differences before generating a synchronization notification to update the first data usage statistics; and

updating the first data usage statistics stored in the memory area based on the reconciliation, wherein the first data usage statistics are not updated when the collected first data usage statistics are more up-to-date than the received second data usage statistics.

8. The method of claim 7, further comprising:

collecting the first data usage statistics related to the data usage plan from a plurality of user computing devices; and

collecting, by a web service, the second data usage statistics related to the data usage plan from the mobile operator, the second data usage statistics representing network data collectively consumed by the plurality of user computing devices which share the same data usage plan.

9. The method of claim 7, further comprising sending the updated first data usage statistics to a plurality of user computing devices based on the reconciliation.

10. The method of claim 7, wherein reconciling the collected first data usage statistics and the received second data usage statistics comprises comparing a timestamp associated with the collected first data usage statistics and a timestamp associated with the received second data usage statistics, the comparison determining which of the collected first data usage statistics and the received second data usage statistics is more up-to-date.

11. The method of claim 9, further comprising sending the synchronization notification to the plurality of the user computing devices, sharing the same data usage plan, based on said reconciling.

12. The method of claim 7, wherein the data usage plan is described using a schema, the schema comprising an extensible markup language schema.

13. The method of claim 7, wherein the data usage plan describes threshold values associated with network connections of a plurality of the user computing devices.

14. The method of claim 13, wherein the threshold values correspond to maximum network data allotted under the data usage plan for the network connections.

15. The method of claim 13, wherein the threshold values correspond to one of a plurality of fields in a schema.

16. The method of claim 15, wherein the one of the plurality of fields comprises one or more of the following: peak times, off-peak times, peak time data consumption quota, off-peak time data consumption quota, peak time data consumption remaining, off-peak time data consumption

remaining, a roaming rate, a mobile operator name, a billing cycle type, and a network connection type.

17. One or more computer storage media embodying computer-executable components, said components comprising:

a schema component that when executed causes at least one processor to:

receive, from at least one mobile operator, a schema populated with data describing a data usage plan associated with at least one user computing device,

distribute the received, populated schema to the at least one user computing device,

subsequently receive, from the mobile operator, an updated portion of the schema, the updated portion of the schema corresponding to an updated portion of the data usage plan, and

subsequently distribute only the received, updated portion of the schema to the at least one user computing device; and

a statistics component that when executed causes at least one processor to:

receive first data usage statistics relating to the data usage plan as collected by the at least one user computing device,

receive second data usage statistics relating to the data usage plan as collected by the mobile operator,

reconcile differences between the received first data usage statistics and the received second data usage statistics, and

send, after said reconciling, a synchronization notification to the at least one user computing device based on said reconciled differences.

18. The computer storage media of claim 17, wherein the statistics component reconciles the received first data usage statistics and the received second data usage statistics by comparing a timestamp associated with the received first data usage statistics and a timestamp associated with the received second data usage statistics.

19. The computer storage media of claim 17, wherein the first data usage statistics represent network data consumed under the data usage plan by the at least one user computing device as determined by the at least one user computing device and the second data usage statistics received by the statistics component represent the network data consumed by the at least one user computing device under the data usage plan as measured by the mobile operator.

20. The computer storage media of claim 17, wherein the schema component and the statistics component execute without interacting with each other.

* * * * *